REMARKS

Claims 1-4, 6-13, 15-17, and 19-21 are pending in this application. Claims 1, 6, and 21 are amended in this paper. Claims 2-4, 7-13, 15-17, and 19-20 remain unchanged.

1. Claims 1, 6, 21 are rejected under 35 U.S.C. § 112, paragraphs as containing subject matter unsupported by the specification.

In response, claims 1 and 6 have been amended and are now fully supported by the specification. See e.g., page 9, line 15 to page 10, line 14 of the Specification.

Claim 21 has been amended and is now fully supported by the specification. See e.g., example 1 (page 22, lines 5 and 6), example 2 (page 23, line 4), example 3 (page 23 lines 15 and 16), example 4 (page 24, line 14) and example 6 (page 26 lines 4 and 5) in the Specification.

2. Claims 1-4, 6-13, 15-17, and 19-21 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 5,830,420 to Borowiec et. al. or WO 97/19199 (collectedly "the Borowiec references"). We respectfully traverse this rejection.

The Examiner states that the Borowiec references suggest the instantly claimed process and product thereof but may differ as to the oxidizing temperature. From the subsequent discussion and especially in the light of the Affidavit of Jacobus Philippus van Dyk ("van Dyke affidavit", previously submitted in corresponding PCT application PCT/1B99/01326, filed on July 27, 1999, and attached hereto), it will be seen that such an anatase phase does not always stabilize even if oxidation is carried out in the temperature range of about 700°C to below about 900°C.

The Borowiec references fail to teach or suggest all of the limitations of the invention as claimed. Specifically, the cited references differ in at least two material respects from the invention as claimed in independent claims 1 and 6. The Borowiec references do not teach that oxidation can be carried out from about 700°C to below 900°C and they do not disclose a method of treating/upgrading titania slag wherein an anatase phase stabilizes in the slag during oxidation. The difference in oxidation temperature over the Borowiec references is discussed in paragraph 3

below. The difference regarding the stabilization of the anatase phase, the significance thereof and the fact that it is not automatically caused by the oxidation is set out in paragraph 4 below.

3. Independent claim 1 relates to a method of treating titania slag to increase the leachability of impurities from the slag and independent claim 6 relates to a method of beneficiating titania slag to increase the TiO_2 content thereof.

The Borowiec references teach that in the treatment of titania slags, oxidation of the slag has to be carried out about 950°C in order to obtain beneficiation of the titania slag. In fact, the Borowiec refences provide two examples (examples 12 and 13) to show that oxidation at temperatures of 850°C and 900°C do not result in upgrading of the slag.

Assuming *arguendo*, that examples 12 and 13 of the Borowiec references disclose the instantly claimed oxidation temperatures, the references show that at oxidation at these temperatures there is no practical upgrading of the titania slag. There is accordingly no teaching that oxidation can be carried out at a temperature from about 700°C to below about 900°C if upgrading or improved leachability is to be achieved as claimed in this application. In fact, the Borowiec references teaches away from oxidizing in the temperature range. Specifically, claims 1 and 6 cannot be obvious over the Borowiec references since these references teach away from the temperature range as claimed in claims 1 and 6 if upgrading is to be achieved. It is accordingly submitted that no person skilled in the art reading Borowiec references would have considered carrying out oxidation at a temperature "from about 700°C to below 900°C" to obtain increased leachability or beneficiation of titania slag.

As the applicants note in their reply to Paper No. 9, the Borowiec references disclose only an oxidizing temperature of at least about 950°C, and preferably between 1000°C and 1100°C and since in the examples the oxidation step was carried out above 1000°C. Moreover, the Borowiec references teach that the titania slag requires a pre-treatment within an unexpected window of process conditions, including an oxidation temperature of at least 950°C.

The conditions described in examples 12 and 13 of the Borowiec references were found to be not suitable, and a person skilled in the art reading examples 12 and 13 would not consider treating titania slag according to the conditions as set out in the same examples. The oxidation temperatures as claimed in the present invention are accordingly neither taught nor suggested by the prior art cited.

Further, the present invention is further distinguished over the Borowiec references, in that the claims of the present invention recite that an anatase phase stabilizes in the slag during oxidation. This limitation is not taught or even suggested by the Borowiec references.

Attached, please find the van Dyk affidavit submitted pursuant to 37 C.F.R. § 1.132. In the process examples described therein, a titania slag was oxidized and reduced under the conditions as set out in claims 1 and 6 of the present invention. However, no anatase formed after oxidation, and upgrading of the TiO_2 content of the slag only increased from 79.3% to 85% (percentage by weight). In the examples of the present invention, the TiO_2 content was upgraded to above 90%. This experimental work clearly shows that an anatase phase does not always stabilize during oxidation of the slag, even if oxidation is carried out "from about 700°C to below about 900°" as claimed in claims 1 to 6 of the present application. Accordingly, the stabilizing of an anatase phase during oxidation is not merely an automatic result, but is a positive step since such an anatase phase does not always stabilize during oxidation.

What was largely unexpected is that in the present invention an anatase phase stabilized when at least certain slags were oxidized at a temperature between 700°C and 900°C. The formation of such an anatase phase (which is retained after reduction) is important when titania slag is oxidized at this lower temperature and is not suggested by the prior art. To the surprise of the inventors, slags treated by a process where an anatase phase stabilizes during oxidation of a temperature as claimed, can be leached under softer conditions compared to the Borowiec references. That is, such slags can be leached at atmospheric pressure (recited, for example, in dependent claim 7) whereas in the Boroweic references (where no anatase phase is formed) leaching has to take place at pressures above atmospheric pressure. Such results are supported by the experimental work as described in the attached van Dyk affidavit.

The application disclosure describes that in at least certain titania slags an anatase phase stabilizes when oxidized from 700°C to 900°C. There may be other ways of treating titania slags to stabilize an anatase phase, but such ways are not known to the inventors. It is believed that if titania slags of the type described in the van Dyk affidavit are treated in a way to stabilize an anatase phase, then such treated slag will also be leachable under less harsh conditions compared to the Borowiec references.

It is submitted that examples 12 and 13 of Borowiec references do not teach the stabilization of an anatase phase during oxidation and it is submitted that no anatase phase did stabilize in those cases. If such a phase stabilized, improved upgrading would have been obtained, contrasted with a TiO_2 upgrading from 78.0% to 80.15% or 85.85% as reported. This is supported by the van Dyk affidavit where a titania slag is formed from a rock type ilmenite (similar to that used in examples 12 and 13 of the Borowiec references) and was oxidized under conditions comparable to that of examples 12 and 13, and no anatase phase stabilized.

Assuming *arguendo* that an anatase phase would have stabilized after oxidation in examples 12 or 13 of the Borowiec patents, there is no disclosure or suggestion that when a titania slag is treated in such a manner that an anatase phase stabilizes, it is suitable to be leached under softer conditions.

From the above it is clear that the formation of a stable anatase phase is not merely a "causing" step, but is in fact a positive step. It is clear from the above that an anatase phase does not always form. The present invention is accordingly distinguished over the Borowiec references due to the formation of the anatase phase. The Borowiec references do not teach nor suggest that in this type of slag an anatase phase will stabilize when oxidized at from 700°C to 900°C with the associated advantages as set out above.

Not only did the inventors recognize that certain slags can be oxidized at lower temperatures (for example, titania slag produced from beach sand ilmenite as recited in claim 21, as amended), but it was found that where slag can be treated to allow an anatase phase to stabilize, such slags can be leached under softer conditions as set out above. It is submitted that the Borowiec references fail to teach or even suggest oxidizing titania slag to form an anatase

phase and to recognize that such slags (after reduction) can be upgraded by leaching the slages at atmospheric pressure. It is submitted that the conditions under which the titania slag must be oxidized to allow an anatase phase to stabilize is neither taught nor suggested by the Borowiec references. No prior art known to the inventors give an indication that an anatase phase will form if slag particles are oxidized under the conditions as set out in the claims.

4. The Examiner states that the Borowiec references teach or at least suggest the claimed positive process steps for providing the instantly claimed stabilizing step. It is submitted that in the light of the van Dyk affidavit, and the arguments presented above, the Borowiec references do not teach the stabilization of an anatase phase and the advantages thereof.

The Examiner states that examples 12 and 13 of the Borowiec references teach the same process conditions as claimed in the present application and it is accordingly not clear why examples 12 and 13 of such references would not also obtain an anatase phase stabilized in the slag. The van Dyk affidavit demonstrates that an anatase phase does not always stabilize. It is indeed not clear why such a phase does not always stabilize. However, the present inventors have found that in certain cases it does stabilize and that it has certain advantages, as described above.

The Examiner states that examples 1 through 11 of the Borowiec references teach the limitation of claim 6 that the TiO_2 content is increased to at least 90% by weight. As stated above, the present invention is distinguished over Borowiec references due to the fact Borowiec references teach oxidation temperatures outside what is claimed in the present invention. Only examples 12 and 13 disclose oxidation temperatures which may fall within the scope of the oxidation temperatures claimed in the instant case. However, the limitations of claim 6 are neither taught or suggested by examples 12 and 13 of the Borowiec references, as claim 6 includes the feature that the TiO_2 content of the slag is increased to at least 90% by weight, whereas in examples 12 and 13 a TiO_2 content of only 80.15 and 85.85% respectively was obtained. Accordingly, the Boroweic references fail to teach or suggest all of the limitations of claim 6, as amended.

Applicants submits that this application is now in condition for allowance. Early favorable action is solicited. No fees are believed due; however, the Commissioner is authorized to apply other charges or credits to deposit account 06-1050, Order No. 12683-003001.

Respectfully submitted,

Date: 9/2/2003

David L. Schuler
Reg. No. 51,190

Fish & Richardson P.C.
225 Franklin Street
Boston, MA 02110-2804
Telephone: (617) 542-5070
Facsimile: (617) 542-8906

20704765.doc